

The Level of Molecules of Average Mass and Lipid Peroxidation Processes in the Semen of Men of Reproductive Age in Kazalinsk District of Aral Sea Region

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Abstract: The scientific problems of the assessing of the impact of environmental factors on human health and the explanation of health-improving activities today are the priorities of state environmental policy in all developed countries. Environment and human health are the actual problems, which currently have the attention of the Republic of Kazakhstan. One of the crisis regions of Kazakhstan is recognized the area of Aral Sea. The sanitary and environmental situation in the Aral Sea region is currently continuing to deteriorate. It may be noted the accumulation of secondary catabolites of lipid peroxidation and the molecules of the average mass in semen of men of reproductive age in Kazalinsk area that indicates the change of lipid peroxidation process corroborating the role of free radical reactions in the development of endogenous intoxication. Results of getting research prove the negative factors on peroxidase activity process, according to MDA cumulative level and accumulation of middle molecules.

Key words: Semen • Medium-Molecular Peptides • Reproduction Health • Lipid Peroxidation • Endogenous Intoxication

INTRODUCTION

The negative factors of human actions are detrimental not for only ecosystems, but they are also a real threat to human life and health. Under the influence of negative environmental factors environmentally dependent changes occur and pathological changes in various organs and systems. These factors stipulate the reduction of life expectancy, the increase of psycho-physiological and genetic stress degree, the increase of specific pathology and the emergence of new forms of environmental diseases [1].

The scientific problems of the assessing of the impact of environmental factors on human health and the explanation of health-improving activities today are the priorities of state environmental policy in all developed countries.

Environment and human health are the actual problems, which currently have the attention of the public the Republic of Kazakhstan. The capacity of industrial production, chemicalization of agriculture and the other anthropogenic processes brought the radical changes to the ecological balance and in some cases it is irreversible.

One of the crisis regions of Kazakhstan is recognized the area of Aral Sea. The sanitary and environmental situation in the Aral Sea region is currently continuing to deteriorate [1,2].

The impact of pesticides on human health represents the greater problem for public health. Thus, the organ chlorine pesticides are found in high concentrations as in soils, in groundwater and the water of Syr Darya, but also in blood of the examined inhabitants. In recent years, all around the world and in particular in the Aral Sea region much attention is paid to influence of heavy metals on the human body, especially lead. Lead enters the environment with exhaust gases of vehicles, used as fuel leaded gasoline, with the emissions of the processing industry, with drainage water and dust from the dried bottom of the Aral Sea [3].

The pollution of ambient air with dust-salt carry-over from the bottom of the dried part of the Aral Sea and sandstorms lead to aggravation of chronic diseases, especially respiratory: chronic bronchitis, bronchial asthma, tuberculosis, as well as the emergence of new non-specific and specific diseases [4].

The overall morbidity is increased, as the level of congenital anomalies, tumors, diseases of the respiratory and digestive system, by more than 2-fold increase in the incidence of blood and blood-forming organs and endocrine system [5].

The vast majority of modern human diseases are the result of environmental pressures. The negative impact of the environment in the context of mass anthropogenic impact is reflected in the deterioration of demographic indicators, in the reducing of the functionality possibilities and the body's defenses, in the increase of the morbidity and mortality [6].

Thus, there is a need of studying the cause-effect relationship between the indicators of the population morbidity and leading toxic environmental factors that will identify the criteria for early diagnosis and prenatal forms of diseases caused by the environmental exposures in the Aral Sea region.

In examined literature, there is no information about the study of lipid peroxidation in men, living in Aral Sea region, which determined the urgency of this problem.

The aim of the study was the objective assessment of health for men in reproductive age, living in Kazalinsk, on molecular-cellular level. The indices of lipid peroxidation cascade estimated in semen of men at the age of 18-49 years. The indices had been assessed on the index of the accumulation of malondialdehyde (MDA) and the severity of endogenous intoxication on the content of the molecules of the average mass.

MATERIALS AND METHODS

Clinical and laboratory studies were performed in the population of Kazalinsk, Kyzylorda region. The total number of the surveyed men was 251. The age of surveyed individuals was 18-49 years. The subject was divided into the following age groups: 18-29 years, 30-39 years, 40 to 49 years. The material of the study was the semen. The determination of malondialdehyde (MDA) was performed according to the method of Korobeinikova [7]. The content of MDA recognized with spectrophotometer against distilled water at a range of wavelengths from 535 ~ 580 nm.

For the determination of the content of medium-molecular peptides in semen of examined persons we use the method of Kovalevskiy and Nifantieva [8]. To 0.1 ml of semen 1 ml of 10% trichloroacetic acid solution was added and this mix was centrifuged for 20 minutes at a speed of 3000 revolutions per minute. To 0.3 ml of

supernatant 3 ml of distilled water was added. The content of middle molecules (medium-molecular peptides, MMP) in semen was determined spectrophotometrically at a range of wavelengths from 254 ~ 280 nm.

RESULTS AND DISCUSSION

A study of the catabolites of lipid peroxidation (LPO) in the semen of examined persons revealed the increasing MDA content in aging group from 40-45 years. (Table 1).

The analysis of the level of middle molecules in the semen of men showed that, during to comparing the examined groups with each other there was a tendency to increase of the average weight molecules levels in semen depending on the age of the men (Table 2).

Thus, comparing the obtained data, it may be noted that the accumulation of secondary catabolites of lipid peroxidation and the molecules of the average mass in the semen of men of reproductive age in Kazalinsk area, indicates the change of lipid peroxidation process, thus corroborating the role of free radical reactions in the development of endogenous intoxication, which is consistent with studies of Lyalichkina *et al.* [9].

Table 1: Indicators of MDA in the semen of men of Kazalinsk area

MDA content, $\mu\text{mol} / \text{ml}$ in semen	
Examined group	Examined groups
Age 18-29 years (n=81)	2.12 \pm 0.19*
Age 30-39 years (n=91)	2.04 \pm 0.32*
Age 40-49 years (n=78)	2.27 \pm 0.23*

Note: * - the significance in comparison with the control, $p < 0.001$

Table 2: Contents of medium-molecular peptides (MMP) in semen of men in Kazalinsk area, cond. units

Contents of MMP in semen	
Examined groups	Examined groups
Age 18-29 years (n=81)	0.59 \pm 0.04*
Age 30-39 years (n=91)	0.60 \pm 0.02*
Age 40-49 years (n=78)	0.61 \pm 0.01*

Note: * - the significance in comparison with the control, $p < 0.001$

CONCLUSION

The results of the study indicate the influence of negative factors of environment of Kazalinsk area on the semen in men of reproductive age, that lead to the accumulation of MDA as catabolite, reflecting the degree

of the activity of peroxidation process and forming the damage of cell membranes structures leading to the disruption of their functional state.

The accumulation of middle molecules peptides also bring the negative effects on the body, as they have a good adsorption on the membranes and lead to disruption of membrane transport, causing the endogenous intoxication in cells with the accumulation of a large number of secondary metabolites.

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